JOURNAL OF PROCEEDINGS

SIXTH ANNUAL COOPERATIVE COTTONSEED OIL MILLS CONFERENCE

at the

SOUTHERN REGIONAL RESEARCH LABORATORY

New Orleans, Louisiana

March 15-17, 1954

Conference was conducted in accordance with the following agenda:

March 15, 1954 - 10:00 a.m. Chairman: J. A. Kime, Office of Director, Southern Utilization Research Branch

Opening Remarks by Dr. C. H. Fisher, Director, SURB
and
Dr. W. W. Fetrow, Farmer Cooperative Service

"Outline of SURB Program on Oilseeds"
J. A. Kime, Office of Chief, SURB
F. G. Dollear, Oilseed Section, SURB

"Status of Cooperative Program on Effect of Processing on Quality of Cottonseed Oil and Meal"
A. M. Altschul, Oilseed Section, SURB

"Laboratory Experiments on Cooking Cottonseed Meats to Produce Improved Meals and Oils"
F. H. Thurber, Oilseed Section, SURB

March 15, 1954 - 1:30 p.m. - Chairman: E. F. Pollard, Engineering and Development Section, SURB

"Pre-Press Solvent Extraction of Cottonseed - Processing Conditions and Characteristics of Products"
W. A. Pons, Jr., Analytical, Physical - Chemical, and Physics Section, SURB

"Status of Commercial Development of Filtration - Extraction Process"
J. J. Spadaro, Engineering and Development Section, SURB
E. A. Gastrock, Engineering and Development Section, SURB

"Report of Survey of Problem of Cleaning Cottonseed and Linters and Preliminary Experimental Results"
L. L. Holzenthal, Engineering and Development Section, SURB

March 16, 1954 - 9:00 a.m. Chairman: Dr. W. W. Fetrow, Chief, Cotton and Oilseeds Branch, Farmer Cooperative Service

"Analysis of Operations"
D. H. McVey, Farmer Cooperative Service, Washington, D. C.

March 16, 1954 - 1:30 p.m. Chairman: W. W. Fetrow, FCS

"A Uniform System of Accounts for Cooperative Cottonseed Oil Mills"
C. R. Rathbone, Controller, Ranchers Cotton Oil, Fresno, Cal.

"Problems in Marketing Linters"
Ralph Woodruff, Manager, Osceola Products Co., Osceola, Ark.

March 17, 1954 - 9:00 a.m. Chairman: W. W. Fetrow, FCS

"Panel on Problems in Seed Procurement"
O. E. Key, Ass't. Mgr., Plains Coop. Oil Mill, Lubbock, Tex.
W. R. Sanders, Mgr., Cen-Tex Coop. Oil Mill, Thorndale, Tex.
Clyde Grice, Mgr., Mid-West Coop. Oil Mill, Hamlin, Tex.

March 15, 1954 - Morning: Chairman, J. A. Kime, SURB

WELCOME

by
C. H. Fisher, Chief
Southern Utilization Research Branch

Mr. Chairman and Members of the Conference:

For the Laboratory and myself I take pleasure in welcoming you to the Sixth Annual Conference of Cooperative Cottonseed Oil Mills. We are very happy to have you with us and we hope that your stay in New Orleans will prove to be a delightful and profitable experience.

Our pleasure in having you with us arises in part from the fact that it is our practice to work closely with the industrial and agricultural groups we serve. As you might know, we cooperate with agriculture and industry from the inception of a research project until its fruition in some practical form. In the early stages we solicit suggestions and comments that will help us to identify the most important and promising projects. As soon as the research has reached the point that the results can be put to work, we cooperate with appropriate groups to facilitate adoption of the new product or process on a practical or commercial scale.

From the foregoing remarks, you can see that industrial and agricultural groups have great influence on our research. To a considerable extent, both the general nature and direction of our research and the volume of effort are influenced by agriculture and industry.

In considering investments in research it is appropriate also to consider the fruits of research. We in the Southern Utilization Research Branch are proud that the record shows that investments in research done here have paid handsome dividends. To illustrate, may I point out that the total annual value of the products and processes that have stemmed from our research--done in cooperation with other organizations--amounts to many millions of dollars. One of the greatest achievements from the dollar standpoint was the development, in cooperation with the Florida Citrus Commission, of frozen orange concentrates. In only a few years this industry has grown to the point that the annual value of frozen citrus concentrates is more than 150 million dollars.

In concluding, I should like to say that is is a privilege for us to work with Farmer Cooperative Service in arranging these conferences and to thank Dr. Fetrow and Mr. McVey for their cordial cooperation.

I wish to thank also Mr. J. A. Kime and other members of the staff of the Southern Laboratory for their splendid efforts in arranging and conducting the conference.

OPENING REMARKS

by

W. W. Fetrow
Farmer Cooperative Service

We are very glad to see so many representatives of the Cooperative Cottonseed Oil Mills present at our meeting here this morning. Your presence here shows that you are interested in working together to improve the operation of your own cooperative business. As you know, this is our sixth meeting. Mr. McVey and I were discussing our first meeting this morning. Even after the arrangements were made for the first meeting, we were very apprehensive as to whether or not many of you folks would be interested in attending a conference of this kind. After six years, we can say that the attendance at and the interest in these meetings have been far greater than we at first anticipated.

When these meetings were started, we knew that we could not tell you folks how to operate your cottonseed oil mills. We did have an idea, however, that we might be of service in getting information to you that would be helpful in your operations. We thought this would be possible in at least three ways.

In the first place, we knew that each of you had a great deal of knowledge of a technical, economic and cooperative nature regarding the operations of the mills represented here. We thought that if this knowledge could be pooled and made available to each of you individually, it would be of great help to each one of you. This exchange of information has been made possible by your frank and open discussion of your problems with each other.

In the second place, we felt it would be of great value to you in your operations if you could be kept currently advised of the results of the research at the Laboratory relating to the problems of cottonseed processing. These meetings have made it possible for you to keep informed of current developments in research of interest to you. Your acquaintance with the Laboratory staff and the work which they are doing has also made it possible for you to make suggestions as to new research projects which might be undertaken.

In the third place, we knew there was a great amount of data on your operations in your annual audits and in your offices which could be very helpful to you if properly assembled and analyzed. We have attempted to prepare these data so you can compare your own operating results with each of the other mills.

You people, as representatives of the mills, are largely responsible for the success of these meetings. Your cooperation in attending the meetings, your willingness to discuss your problems frankly and freely, and to make information available to us for comparison with other mills have been very fundamental to the success of these conferences. In saying this, I do not want to detract one iota from the contribution the staff of the Southern Regional Research Laboratory has also made. They have given us wholehearted cooperation and made their facilities available to us. Without the cooperation and assistance of the Laboratory, these meetings could not have contributed to the improvement of your operations as much as they have.

We also want to acknowledge the fine cooperation and encouragement the Banks for Cooperatives have given in many ways and their contributions to the success of these conferences.

We have emphasized repeatedly that these are your meetings and should be conducted according to your own wishes. The rest of us are only working for you.

FISCAL AND ADMINISTRATIVE ASPECTS OF SURB OILSEED RESEARCH

by
James A. Kime
Southern Utilization Research Branch

At present the Southern Utilization Research Branch receives 95 percent of its operating funds directly from Congress; the other 5 percent consists of a number of allotments from other government agencies in the Department of Defense, for investigation of specific problems of special interest to them and which are related to our regular program of work.

The term "Southern Utilization Research Branch" is the new name for a group of field laboratories which had been operating in the South as a coordinated unit under the former Bureau of Agricultural and Industrial Chemistry. The names and locations of these Laboratories, or Stations, and the principal commodities investigated at each are:

Southern Regional Research Laboratory New Orleans, Louisiana	Cotton, oilseeds, rice, sweetpotatoes, sugarcane
U. S. Sugarcane Field Station Houma, Louisiana	Sugarcane
U. S. Tung Oil Laboratory Bogalusa, Louisiana	Tung
U. S. Fruit and Vegetable Products Laboratory, Weslaco, Texas	Fruits and vegetables of Rio Grande Valley
U. S. Citrus Products Station Winter Haven, Florida	Citrus
Naval Stores Station Olustee, Florida	Pine Gum
U. S. Food Fermentation Laboratory Raleigh, North Carolina	Cucumbers

For the conduct of research at these Laboratories, or Stations, and for the maintenance of the buildings and grounds, the Southern Branch received $2,079,000 in the current fiscal year. This amount was allocated to different

commodities or types of commodities, as follows:

Rice	1%	$ 24,700
Cotton	49%	1,023,000
Fruits and Vegetables	9%	189,700
Oilseeds	27%	553,500
Sugarcane and Pine Gum	14%	288,100
	100%	$2,079,000

The Research and Marketing Act of 1946 authorized the Department of Agriculture to let research contracts to other organizations. Starting with the 1948 fiscal year, we have executed annually a number of research contracts with organizations that have special facilities or skills for the investigation of important problems. Currently the annual amount allocated for this type of research is $111,000. With the funds provided, contracts have been let for investigations on cotton, cottonseed, rice, sugarcane, and pine gum. Recently a contract was let to the University of Tennessee for an investigation of certain aspects of the chemistry of gossypol--the major pigment in cottonseed.

Our research is planned, conducted, and financed under the Uniform Project System of the USDA. The major project is the financial project. This document describes briefly a broad field of work and lists the commodities or types of commodities to be investigated. Congress appropriates money by financial project. Under the financial project there are work projects, which are somewhat narrower in scope, and under these are line projects. The latter are documents describing a specific piece of work to be conducted in a limited period of time, usually 2 years.

One financial project covers all oilseed utilization investigations of the four Regional Laboratories. Under this broad project the Southern Branch, as indicated above, obtained $553,000 for this year's work. The amount spent on different oilseeds is estimated to be:

Cottonseed	$403,000
Peanuts	89,000
Tung	31,500
Minor oilseeds	30,000
	$553,000

Limited effort, amounting to about $7,500 per annum is devoted to the rice oil extracted from rice bran. This brings the total effort on oilseeds and vegetable oils to $561,000 for this year.

In planning and developing research programs the amount of effort is usually expressed in terms of man years. The effort under a line project may vary from one-half to 5 man years, depending on the urgency and the nature of the work. In an established research organization the dollar cost of a project can be quickly calculated when the man years of effort is known. In the Southern Branch as a whole, and presumably this value is typical of any sizeable research organization doing largely chemical work, the cost per research worker is $10,400 per year. This figure was obtained as follows:

$$\frac{\$2,079,000}{200} = \$10,400$$

The total professional staff currently numbers 200.

The amount of research effort which the oilseed appropriation will support may be calculated:

$$\frac{\$561,000}{\$\ 10,400} = 54 \text{ research workers}$$

Therefore, a line project which consumed 2 man years of effort cost about $21,000.

On January 1 the Southern Branch's research program on oilseeds and oilseed products was described in 27 line projects. This means that, on the average, each project is receiving 2 man years of attention. This includes both the investigator in the laboratory and a proportionate part of the time of administrative officials.

Discussion

Graham: Are the 27 separate projects all on cottonseed?
Kime: No, they are on peanuts, tung, other oilseeds, including rice bran, as well as cottonseed.
Graham: Are the projects on oilseeds interrelated?
Kime: Many are. For example, several projects as a group comprise our program on improving the nutritive value of cottonseed meal.
Hazleton: Did the Southern Laboratory make $3,000,000 on royalties as a result of the development of the conforming bandage?
Kime: No, the patents are assigned to the United States Department of Agriculture. Dr. Fisher was referring to the value of products and findings to industry. For example, the new cotton elastic bandage adopted by the military was less expensive than other types of bandages. For the treatment of burns, the military tested three types of elastic bandages: (1) bandage with rubber threads; (2) bandage with twisted yarn; and (3) the mercerized process bandage developed by the Southern Regional Research Laboratory. The mercerized bandage proved to be the best both for medical and cost reasons. The mercerized bandage costs only 20 cents per roll compared to 65 cents per roll for the bandage with the rubber threads. From the number of kits ordered by the military, using the mercerized bandage realized a saving of about 5 million dollars to the taxpayers.
Fisher: I was not referring to the profits as I do not know how we would figure them. In some instances I was referring to the annual value of the products involved. The work done at the Winter Haven Laboratory in cooperation with the Florida Citrus Commission on citrus juice concentrates resulted in the production of a product that has an annual value of 170 million dollars.

OUTLINE OF SURB'S PROGRAM ON OILSEEDS

by

Frank G. Dollear
Southern Utilization Research Branch

The objective of all of the research on oilseeds is to increase the utilization of these commodities. Commodities with which the Oilseed Section is concerned are: cottonseed, peanuts, tung fruit and rice bran. The situation with respect to oils is one of surplus — both of edible and drying type oils. High quality protein feeds are not in a surplus position. Our research program changes to meet current needs.

The types of research which we are carrying out can be divided into two categories: first, research to improve the quality of products; second, research to develop new products and create new uses. Under the first category, quality research may improve the competitive position of one oilseed to another. It may also lower the cost of oil by increasing the value of the coproduct or by-product. Therefore, the oil may be a more attractice raw material for the chemical industry. Research on a coproduct or a by-product may even lead to the creation of a new product or new markets for materials. An example of research in this category is the investigation of cottonseed processing to improve the nutritive value of the meal and to render it suitable for unrestricted feeding to swine and poultry. Experiments are under way on special cooking procedures using the addition of chemicals to produce cottonseed meal of higher protein quality and low gossypol content. A part of this program involves development of chemical tests to measure nutritive value of cottonseed meal, and an investigation of the nature of bound gossypol which is formed during cooking of cottonseed.

Another type of research in the same category is research to improve the color of cottonseed oil. Many cottonseed oils require special processing in order to be used in high quality shortening. This constitutes a problem whose solution would render cottonseed oil more competitive with other oils. In the research on cooking of cottonseed referred to above, some of the procedures have yielded oils of improved quality. Another approach to this problem is the basic research to determine the pigments present in cottonseed oil which are responsible for the dark color and from a practical standpoint to find ways of removing these pigments.

An investigation of gossypol chemistry is being carried out under contract at the University of Tennessee. Here, we are attempting to obtain better or additional evidence for the structure of gossypol.

Research on the storage of cottonseed at the present time involves only the isolation of microorganisms which may contribute to fatty acid formation in stored cottonseed.

We have recently finished an investigation of the quality improvement of peanut butter. Now, we are embarking on an investigation to determine the relation of quality in peanut products to composition or to variation in composition or

components. The ultimate objective is to determine what factors are responsible for the poor quality of peanuts which have been grown, harvested or handled under certain conditions, so that better quality peanuts can be delivered to the processor of edible peanut products. We are also carrying out a project on the improvement of the stability of salted peanuts by the use of special fats and antioxidants.

Research on tung fruit is carried out at a field station of this Laboratory in Bogalusa, Louisiana. Tung meal is toxic and some research is being done to isolate the toxic constituents of the meal to see if they can be removed and to determine by some suitable chemical test whether the meal has been rendered nontoxic. We will also carry out a materials balance to determine the oil yield during the milling of tung fruit in screw press operation and we hope that this will point the way to improving oil yield during the milling operation.

We are carrying out some research related to the problems of refining rice oil. Rice oil ordinarily gives a rather high refining loss and we are working to concentrate a surface active agent from the oil which we feel may be responsible for this high loss.

Under the second category in the development of new uses and new products from fats and oils, we are looking particularly to new uses in the chemical industry in those fields which are expanding. There are two types of work under which this program may be divided. The first is food uses. This does not apply to fats and oils as a source of calories since it is doubtful whether increased markets can be anticipated in this field other than those which would gradually follow increase in population. However, we feel that there are good prospects for products which may be developed from fats which will have useful properties as coatings to protect foods from moisture loss and quality deterioration. Here, the products would need to be edible but would not necessarily be consumed for their caloric value and might even be removed from the food before being consumed. Research has been carried out on the modification of glycerides to incorporate short chain fatty acids which have given acetostearins, waxy, translucent, flexible fats which appear promising as coatings for foods, meat, fruits etc. We are at the present time carrying out some tests on these materials as coatings for raisins. The unsaturated corresponding fatty acid products are acetooleins which have the property of increasing the plastic range of hard fats and which we have used in compounding an edible spread of long plastic range for the Quartermaster Food and Container Institute. The requirements for such a spread are that it must be spreadable near freezing temperatures and stable for six months at 100°F, both physically and from the standpoint of flavor. The spread formulation which we are now testing uses peanut oil as one of its ingredients. The acetoglycerides have promise as plasticizers, food coating ingredients, ingredients of strippable plastics, etc. The Western Regional Research Laboratory is now making toxicity tests on them and at least two industrial firms are making acetoglycerides on a pilot plant basis.

Another use for oils which is not exactly a food use is in intravenous alimentation. Here emulsions of fat are required which can be given intravenously to supply calories to those people who cannot eat or who cannot absorb fat normally in the gastro intestinal tract. In work on the development of suitable fats and oils for intravenous feeding we are investigating surface and interfacial tension of oils and are supplying fats and oils both natural and synthetic to various medical investigators for testing. This program is supported by the Office of the Surgeon General.

In the industrial or nonfood uses, we look particularly to the chemical industry and those fields which show great potential or possibilities of expansion. Such fields are plastics, plasticizers, lubricants, surface active agents and agricultural chemicals.

Cottonseed oil or the acids from cottonseed foots have a high content of linoleic acid. Exploratory investigations are being carried out on the production of new compounds by the reaction of various reagents at the double bonds of linoleic acid. These new compounds include nitriles, hydroxyacids and sulphur compounds. Research is also being carried out on cottonseed oil foots to learn more about its composition and any new or unusual materials which it might contain. Cottonseed foots or similar foots have recently been recommended for use in feeds and we are examining foot samples for gossypol content to determine their suitability for use in feeds as far as chemical composition is concerned.

Research has also been carried out on tung oil to develop new compounds. One of these, a mercury derivative was not sufficiently stable to have very practical value. However, research is continuing on tung oil or its acids and reactions will be carried out which we hope to lead to surface active agents, polyester resins, sizes, agricultural chemicals, etc. Samples of materials prepared under these research programs are being sent to the Chemical and Biological Coordination Center for testing for biological activity, and when they become available samples of promising materials will be evaluated in various industrial laboratories through the cooperation of industry.

Discussion

Graham: Why the variation in color of cottonseed oil between one season and another?
Dollear: This is one of the agronomic factors. It is a matter of climatic conditions and may vary with the soils.
Graham: Could a heavy application of Toxaphene during growth have any effect on the color of the oil?
Dollear: I don't know. I would say it probably would not affect oil color.
Vining: Do you have any knowledge of the effects of the age of seed and its time of storage on the color and quality of the oil?
Dollear: It depends upon the seed. The seed does not improve with age. The greater the moisture content of the seed, the temperature of storage, and the time of storage, the darker is the color resulting in the oil.

Graham: After the temperature becomes stable in the stored seed, do you need continued flow of fresh air through the seed?
Altschul: Storage doesn't improve the seed. You will note that when you slice a new seed the pigment is light, but when you slice a seed that has been in storage, the pigment is dark. Therefore, it seems reasonable that there would be more color available to the oil. To answer your question, I don't know, but I think continued air flow wouldn't help because it would tend to oxidize the pigment glands. I would continue to aerate the seed to keep it from becoming heated.
Graham: Are you conducting a study on sesame?
Dollear: We're not working on sesame at the present time. We have published ten papers which include information on the properties of the oil and meal, anti-oxidants present in the oil, and toxological properties of sesamol. Mr. Gastrock, are you doing any work on sesame?
Gastrock: Yes, we are making small scale studies on the application of filtration-extraction of sesame.

NEWER KNOWLEDGE ABOUT COTTONSEED PROCESSING AS IT AFFECTS THE QUALITY OF THE OIL AND MEAL

by

A. M. Altschul
Southern Utilization Research Branch

For the last several years there has been underway a comprehensive program of research on the processing of cottonseed as it affects the quality of the meal and oil. Participating in this program have been research workers in federal, state, and industrial institutions. This program has enjoyed the wholehearted cooperation of the cottonseed products industry, its member mills, and its official organization, the National Cottonseed Products Association, its Educational Service, and its fellowship program. It is the purpose of this discussion to bring to you some of the results that have come out of this program in the last year.

We have a better idea of the factors that determine the quality of cottonseed oil and meal. The most important quality factor in cottonseed oil is the color of the refined and bleached product that is attained at minimum loss. In the last year we have demonstrated that the presence of gossypol in the oil has a profound influence on color reversion of the crude oil between the time that it is made and the time that it is refined. This was demonstrated by removing gossypol during the cooking operation prior to production or from the oil immediately after its production. In both of these instances crude oils were produced which were completely stable to color reversion upon storage.

It is generally agreed that cottonseed meal is good for cattle feeds and that the conditions of production have little influence on its value for this purpose. In looking for broader markets in the poultry and swine feeds there are certain quality factors that must be maintained. These are: (1) a minimum concentration of materials that interfere with growth and (2) the preservation

of protein quality. Events within the last year have allowed us to make a firmer statement about the concentration of free gossypol in cottonseed meal which interferes with growth. There is general agreement that cottonseed meal containing 0.04% or less of free gossypol can be fed safely in all concentrations to growing poultry and swine. Such meals, however, cannot be fed to laying hens because they cause egg yolk discoloration in the stored eggs. This does not mean that gossypol in the meal is the only factor that interferes with growth or that we know the entire picture. But it does mean, however, that this is the measure that has consistently given us satisfactory relationship with interference with growth.

The second meal quality factor is not so easy to define. It is the extent of damage or lack thereof that has occurred to the protein during processing. The measure which seems to approximate more closely the measure of heat damage is the solubility of the nitrogen in 0.02 normal alkali. The greater the solubility, the less is the heat damage. Tentatively it has been felt that meals that have a nitrogen solubility greater than 75% are definitely better sources of protein than those below 75% in solubility.

On the basis of these quality factors for oil and meal it can be said that the hydraulic press method of processing produces high quality oils but produces meals of free gossypol content usually too high to be used for swine and poultry. The screw press method produces inferior oils to the hydraulic press method but usually produces meal of free gossypol content below 0.04%. Generally, however, the meals are overheated and the protein quality has been damaged. The prepress solvent extraction technique produces oils that are inferior to the hydraulic press oils but the meals have low free gossypol content and many of them have experienced a minimum of protein damage. Thus these meals would seem to be among the best that are available commercially for extended utilization. A blanket statement about straight solvent extracted meals cannot be made because there is no standardization of the procedures in the commercial processes.

Investigation of all of these processes and their shortcomings has indicated that the most important work that could be done to improve the quality of the products from the present processes is to understand more about what happens during the cooking operation and to introduce modifications therein which would allow the production of high quality oil and meal by whatever method of oil extraction is practiced. Research has been underway at this Laboratory on the fundamentals of cooking and there is some evidence that when the cooking is modified in such a way as to disrupt all the pigment glands (use of moisture contents above 22% in the cooker) and when acid and alkali are added meals of superior nutritive value are produced. There is a tentative conclusion that is now being subjected to a rigorous experimental verification. When alkali is used in the cooker it seems that the oil produced has no gossypol and is stable to color reversion upon storage of the crude oil.

Another approach to this problem is to develop a chemical method of treating the oil immediately on production to precipitate the gossypol. This work has

also been accomplished in the Laboratory using para-aminobenzoic acid which is a very effective precipitant of the gossypol. In order to be commercially feasible this practice would have to involve the use of much cheaper precipitants.

The investigations on improving the nutritive value of cottonseed meal were spurred on by two nutrition conferences held at this Laboratory in November 1950 and 1951. As a result of these efforts the problems became more clearly defined. These efforts culminated in the last conference held in November 1953, in which it was possible to make a clear-cut definition of the status of cottonseed meal nutrition. The following is quoted in its entirety from the Proceedings of the Semi-Annual Meeting of the Nutrition Council of the American Feed Manufacturers' Association held November 30 to December 1, 1953:

"A Cottonseed Meal Nutrition Research Conference was held November 9 to 11, 1953 at New Orleans. The meeting was sponsored by the Southern Regional Research Laboratory and the National Cottonseed Products Association and was attended by workers in the field from colleges, experiment stations, and the industry. The following conclusions were formally adopted at the close of the Conference by those in attendance:

> "Results presented thus far indicate that rations containing cottonseed meal and soybean meal in equal proportions on a nitrogen basis are equal or superior to rations based on either cottonseed meal or soybean meal alone, when the cottonseed meal was 0.04 percent or less of free gossypol and 75 percent or more of nitrogen solubility in 0.02 normal sodium hydroxide solution.
>
> "Preliminary indications are insofar as free gossypol is concerned, that cottonseed meal having 0.04 percent or less of free gossypol can be fed in unrestricted proportions in balanced diets for chicks, broilers, and swine.
>
> "Because this research work implies additional use by feed manufacturers of cottonseed meal in poultry and swine feeds, it was decided to appoint a cottonseed subcommittee headed by Dr. Leo Curtin. The purpose of this subcommittee is to more closely correlate the research and development by the cottonseed meal producers and government agencies with the requirements of the feed industry. The subcommittee plans to present a display of cottonseed meal samples at the May 1954 meeting for preliminary evaluation of the Nutrition Council. These samples will include solvent, hydraulic, and expeller processed meals. They will be divided into two categories, one suitable for swine and poultry and the other for ruminants. Meals of various protein analyses will be available. The objective will be to submit to the processor final samples representative of the entire council preference for their guidance."

Thus you can see a concrete practical demonstration of the effect of research on the quality of cottonseed meal. We consider that the 1953 meeting was a milestone in the progress of increasing utilization of cottonseed meal and represented the culmination of the efforts of many for several years to bring about a reopening of the cottonseed meal question and a broadening through research of its potential for utilization.

Discussion

Hazleton: Are commercial laboratories equipped to handle the analyses of meals for percent gossypol and nitrogen solubility?
Altschul: Yes they are. You can also get information for the equipage of a laboratory by writing Mr. Hopper at this Laboratory.
Jackson: Are the tests expensive or difficult?
Altschul: No, any high school graduate can perform the tests. The tests have been well planned and developed to simplicity.
Graham: Can you breed the gossypol out of cottonseed?
Altschul: Yes, but the seed so bred were sterile.
Kulkarni: Can you set a limit in color deterioration in a given meal or oil?
Altschul: No, the more the gossypol, the greater the color.

LABORATORY EXPERIMENTS ON COOKING COTTONSEED MEATS TO PRODUCE IMPROVED MEALS AND OILS

by
F. H. Thurber
Southern Utilization Research Branch

Different processing procedures are required for cottonseed than for other oilseeds because cottonseed contains pigment glands. The chief component of these glands is gossypol and other similar pigments. These pigments interfere with the nutrition of swine and poultry and are responsible for color reversion in cottonseed oil. Accordingly, it would appear that the objective in processing cottonseed should be to produce a good oil and to either remove or inactivate gossypol without lowering the nutritive value of the protein by excessive heating or by any other means.

Laboratory experiments are underway to aid in attaining this objective. An essentially gossypol free meal was prepared to serve as a standard in chick feeding studies. In making this meal, the oil was first extracted with hexane and followed by a second extraction with butannone to remove gossypol. The protein efficiency of this meal (determined by chick feeding studies) was assigned an arbitrary index value of 100. On this scale many commercial meals range in nutritive value from about 40 to 90. In another laboratory experiment the effect of variations in pH during the cooking of cottonseed meats is being studied. To date the best results have been obtained by rolling the meats, breaking the pigment glands by vigorous stirring of the meats with about 35% of water containing bases or acids, in a mixer modified to produce the required mechanical action, followed by drying at a maximum temperature of about 212°F. Oil was extracted with a laboratory type solvent extraction apparatus. When approximately 0.5% alkali (NaOH), based on the weight of the meats, was used in the cooker, many of the meals had an index value of about 120 and free gossypol contents below 0.03%. Similar values were obtained when a small amount of phosphoric acid was used although the free gossypol content was higher. Crude oils from the alkali cooks were essentially free from gossypol and were not subject to color reversion.

Discussion

Frampton: Have you tried using alkaline phosphates?
Thurber: Yes, we have. In some of the tests sodium hydroxide was added in water solution; after the pigment glands were broken, phosphoric acid was added to lower the pH of the water in the cooker to about 5.6.
Frampton: I meant secondary and tertiary alkaline phosphates.
Thurber: The type of salt formed would depend on the amount of sodium hydroxide used and the pH after the addition of acid. No doubt such salts were formed in some of the tests.

March 15, 1954 - Afternoon: Chairman, E. F. Pollard, SURB

PREPRESS SOLVENT EXTRACTION OF COTTONSEED PROCESSING CONDITIONS AND CHARACTERISTICS OF PRODUCTS

by
W. A. Pons, Jr.
Southern Utilization Research Branch

The use of prepressing followed by solvent extraction is a relatively recent and growing development in the cottonseed processing industry. Current interest in improved processing methods for increasing the nutritive value and extending the utilization of cottonseed meal, without lowering the quality of the oil, prompted a survey of meals and oils currently produced by the prepress solvent extraction method. Twenty-six complete sets of mill samples of known processing history were obtained through the cooperation of 10 mills located in six states. Each set of samples included sufficient meal for evaluation by chick-feeding tests conducted by cooperating nutrition laboratories.

As chemical measures of protein denaturation and damage during processing, nitrogen solubility in 0.5 N sodium chloride and in 0.02 N sodium hydroxide were used. Changes occurring in the distribution of the gossypol present in the seed were followed by means of available methods for free and total gossypol.

The major reduction in nitrogen solubility took place during cooking. Very little reduction occurred in pressing and somewhat more occurred during solvent extraction and meal driving. Calculated as percentage reduction from the values found for the original prepared meats, reduction in nitrogen solubility in 0.02 N sodium hydroxide ranged from 13.8 to 26.2% to 13 percent, the levels were far below those previously encountered in low-temperature screw pressing (29-41%) or high-temperature screw pressing (7-46%). A reduction in free gossypol occurred during solvent extraction, however, it was accomplished by removal of the gossypol with the solvent extracted oil rather than by binding to the meal.

The prepressed oils seemed to be superior to the solvent extracted oils since they showed lower refining losses, and lower refined and bleach colors. Upon storage at elevated temperature (100°F.) both types of oils exhibited bleach color reversion with the increase in bleach color being greater for the solvent oils.

In the final meals, free gossypol content seemed to be somewhat constant within a given mill. Four mills produced meals with free gossypol contents ranging from 0.025 - 0.035% while meals from the other mills averaged close to 0.050 percent. Considerable variation was found in total gossypol content; values ranged from 0.7 to 1.3%. Nitrogen solubility in 0.5 N sodium chloride ranged from 26 to 46%, while that in 0.02 N sodium hydroxide ranged from 65 to 83%.

PRESENT STATUS OF THE FILTRATION-EXTRACTION PROCESS FOR COTTONSEED

by
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Southern Utilization Research Branch

Introduction: On January 29, 1954 the development of the Filtration-Extraction process hurdled that important transition phase from pilot plant investigations to commercial scale operations. On the morning of that day an employee of the Planters Oil Mill, Mississippi Cottonseed Products Co., Greenwood, Miss., measured the oil tanks as usual to record the previous 24 hours production. The amount he measured showed 5,600 lbs. or 750 gallons more than he expected. He thought that someone had opened the wrong valve during the night. He was about to report this to the superintendent when he was told that the "extra" oil was produced by the filtration-extraction plant, the continuous operation of which was started on the previous day. The 750 gallons was the quantity of oil-gain expected by converting from hydraulic pressing operations to filtration-extraction.

Commercialization of the filtration-extraction process has been made possible by the cooperative efforts of Lukens Steel Co., Miss. Cottonseed Products Co. and the Southern Regional Research Laboratory. The first commercial plant has been designed and erected by Lukens Steel Company for the Mississippi Cottonseed Products Company at Greenwood, Miss. Rated capacity of the plant is 150 tons of cottonseed or 75 tons of soybeans per day.

Since the start of continuous operations with the filtration-extraction plant at Greenwood, the plant has operated for about 40 days, shutting down only on weekends or for periodic check of certain equipment. During this time the plant was operated at capacities up to 168 tons per day. The conditions required for processing cottonseed at Greenwood have been fairly well established, and in the near future it is contemplated to determine the operating conditons for soybeans. As was the case with cottonseed, it is expected that the conditions for soybeans will correlate those determined in the pilot plant investigations at the Southern Regional Research Laboratory.

Commercialization of the process should be of interest to all members of the cooperative cottonseed oil mills since it is possible that, in the future, any one of the members may have something to do with a filtration-extraction plant. For example, bank representatives who are members may be confronted with the responsibility of loaning money for the construction of a new filtration-extraction plant or for the conversion of hydraulic and screw press mills to filtration-extraction.

In order to more thoroughly understand the commercial application of the process, it is better to first present a flow diagram of the process, and secondly, to describe several recent process improvements, most of which have not appeared in publications. These improvements were undertaken with process commercialization in mind. Most of them have been utilized in this first plant at Greenwood.

(Insert Flow Diagram)

Description of a Flow Diagram: Flakes are prepared in the usual manner — however, when dry seed are being processed, sufficient water is added to either the meats or flakes to increase the moisture content to 11-12% before entering the cooker. Flakes are mildly cooked, in conventional 5 or 6 high stack cookers, and at a moisture content higher than is normally used in cooking for hydraulic pressing. It is mildly cooked in that the cooking time is less and the temperature lower. The cooked material is crisped by evaporative cooling and by reducing the size of the large agglomerates formed during cooking.

In the commercial plant the cooked flakes are conveyed to the solvent extraction building where they are fed, along with one of the miscella filtrates, to the extractor or slurry mixer. After about 40 minutes soaking the resulting slurry is deposited onto the pan of the rotary horizontal filter where it is filtered and the cake countercurrently washed three times. The first filtrate is recylced onto the filter cake at a point immediately after the initial slurry filtration phase to remove over 80% of the fines. The No. 2 filtrate from this recycling operation is the product miscella and goes to the oil recovery system.

The oil-free solvent is the third and final wash liquid. It is pumped onto the cake just before the solvent-damp meal (marc) is discharged to the dryers. The filtrate (No. 5) from this final wash is used as the second wash liquid, and, the filtrate (No. 4) from this second wash liquid is used as the first wash. The No. 3 filtrate which is obtained from the first wash is the miscella that is pumped to the extractor to make up the slurry to complete the cycle of the liquid around the filter. Conventional equipment is used for the oil recovery and desolventizing operations.

Recent Process Improvements: The following is a discussion of the improvements in the processing procedures and operating features of the process. The phases of the process around which these improvements are centered are shown in the left column of Table I.

Table I

Improvements	Early P.P. Work	Recent P.P. Work
Conditioning of meats or flakes	All H_2O added to cooker	For dry seed, part of H_2O is added to meats or flakes
Method of Crisping	Trays -- large agglomerates broken by hand	Screw conveying and aspiration
Further treatment	Rerolling of crisped material	Screening, and hammermilling the overs
Conveying of cooked meats	-	Tests up to 510 ft. showed detrimental effect
Extraction temperature	75 to 85°F	110 to 130°F
Filter medium	24 x 110	60 x 60
Recycling of first miscella	No recycling	Recycled
Cake thickness	1 inch	2 inches

Conditioning of meats or flakes before cooking is important especially when processing dry seed. Last year some dry Texas seed was processed, and it was found that the filtration-extraction characteristics of the resulting cooked material were not as good as the results obtained with other higher moisture content seed. By increasing the moisture content of the flakes from 7.0 to 11-12% by adding, to the meats or flakes, a part of the water normally used in the cooker, satisfactory filtration-extraction characteristics were obtained. It happened that at Greenwood the seed being processed was very dry, and this technique proved very helpful.

In our early pilot plant work crisping was obtained by spreading the cooked material on trays for 15 to 20 minutes and by breaking up large agglomerates by hand to permit uniform evaporative cooling. This procedure was not considered practical for commercial application and consequently in the later work the cooked material was crisped by screw conveying a short distance of up to 17 feet and asperating the air over the material. This new procedure was continuous and took less than one minute -- factors which were important for process commercialization.

The crisped material contained hull encased meat particles which, if reduced in size, would decrease the residual lipids by several tenths of a percent. For this reason the crisped material was rerolled, an operation which was considered to be rather difficult and expensive since another set of rolls was required. In recent pilot plant runs the procedure was changed in that the

crisped material was screened over a shaker screen and the "overs" amounting to less than 10% was hammer-milled and returned to the meats stream. Equipment for screening and hammer-milling was installed at Greenwood but will be used only if the further reduction in lipids is desired.

In some commercial installations it is necessary to locate the solvent building an appreciable distance from the preparation building. Consequently, the effect that screw conveying would have on the characteristics of the cooked material was determined. Pilot plant tests showed that, with increase in screw conveying distance, the mass velocity or filtration rate of the material decreased appreciably. As a result a belt conveyor was recommended and used at Greenwood where the prepared material is conveyed a distance of 450 feet to the solvent building.

In the early pilot plant work, filtration-extraction was conducted at room temperature. At elevated temperatures of 110 to 130°F. lower residual lipids were obtained; and no vacuum difficulties were encountered at these temperatures.

As the process showed commercial possibilities a more open weave filter medium than the 24 x 110 plain Dutch weave wire cloth was desired to insure the maintenance of a clean filter medium for continuous 24-hour-per-day operation. A 60 x 60 mesh plain weave stainless steel screen which had holes going straight through as compared to the more intricately woven Dutch screen proved more practical. Moreover, when it was used in conjunction with the new procedure of recycling the first miscella filtrate onto the filter bed, the fines content of the product miscella was reduced to a low limit. By recycling this first filtrate onto the filter, the cake acts as a filtering medium to remove the bulk of the fines. The amount of fines are reduced from about 0.30% to 0.03 to 0.05% by weight.

Cake thickness of about 2 inches proved to be the most practical for all around operation.

Commercial-Scale Operations: The following information pertains to the operation of the first commercial-scale filtration-extraction plant located in Greenwood, Miss. Most of the following data is based on operations of the plant during the first few days after the start of continuous operations.

Processing conditions for the commercial scale operations were comparable to those found practical in the pilot-plant scale investigations at the laboratory. The important difference was the quantities of material processed — 7,100 lbs. of prepared meats per hour at the commercial plant compared to 300-450 lbs. per hour in pilot plant runs, or in terms of cottonseed per day 140 tons and 12 to 18 tons respectively.

Material preparation. Flakes from the rolls are conveyed first to a surge bin and then to the six-high stack cooker. About three to four times the amount of flakes required for the cooker are conveyed out of the surge bin, the excess goes to a "run-around" conveyor feeding back to the surge bin. This procedure was conducive to the production of fines especially with the dry seed being processed. And for this reason it was even more important to moisten the flakes before cooking as previously described in order to attain the final material agglomeration desired.

When the material was prepared for hydraulic pressing, water was added at the surge bin discharge conveyor to increase the moisture content of the flakes from 7 to 9-10%. For filtration-extraction water was added at the same place to increase the moisture to 12%, but it was noted that, with changes in levels in the surge bin, the moisture of the flakes to the cooker varied. At times it varied to 14%. The high moisture tended to "ball up" the material and thereby interfere with the feed to the cooker. This difficulty was eliminated and smoother operations attained when the water was added to the flakes at the conveyor from the rolls, and the amount of water added regulated with the incoming meats. Steam and additional water were added to the flakes in the second ring of the cooker to increase the moisture content of the material to about 17.5%. Total cooking time was 70 minutes at temperatures between 200 and 226°F. The cooked material was discharged at a moisture content of 10% to a 10-foot cut-flight conveyor to start the crisping operation. A bucket elevator lifted the material to the belt conveyor. The bucket elevator and the belt conveyor were aspirated to complete the crisping operation. Moisture content after crisping was 8.0%. The belt conveyor delivered the prepared material to the solvent extraction plant.

Solvent extraction. (At this point a pictorial cut-away drawing of the commercial scale filtration-extraction plant was shown and described. The description included the flow of materials through the various equipment units.)

The cooked crisped material from the belt conveyor is fed to the extractor or "slurry mixer" where it is mixed with a miscella filtrate from the filter. Extraction temperature varied between 115-125°F. Retention time in the extractor was 55 minutes at the 140 tons per day rate. At 150 tons per day, the retention time is 51 minutes. A solvent to meats ratio of 1.1 to 1.0 by weight was used. Filtration data were as follows: Filter medium, 60 x 60 mesh stainless steel screen; cake thickness, 2 inches; vacuum, 8-10 inches mercury; and solvent in the wet cake (marc) discharged from the filter, 20% by weight. Solvent in the marc is expected to increase to about 26% with the re-installation of the third wash which was disconnected during the early equipment test runs. The marc was desolventized in a conventional hearth-type "toaster-desolventizer" for recovery of meal and solvent. The meal was screw-conveyed to the meal room, and the solvent vapors passed through condensers and the condensate collected in the solvent wash tank. The crude oil was recovered from the product miscella in conventional equipment (evaporator and stripper), and after cooling it was pumped to the oil storage tanks.

Product Quality. The quality of the oil produced after continuous operations were attained was equal to or slightly better than the oil that had been produced by their hydraulic pressing method. A meal sample was taken during the first week of continuous operation. Analyses showed a free gossypol content of 0.045% and a nitrogen solubility of 7.00% (in 0.2 N NaOH). These results closely approach the desired analyses for a good cottonseed meal (free gossypol - 0.04% or less, and nitrogen solubilities of 75% or higher) which, as pointed out in a discussion on the nutritive value of cottonseed meal, should be the aim of cottonseed processors in order to produce a meal that can be widely used.

Discussion

Howells: What would be the cost of a filtration-extraction plant in comparison to an equal capacity prepress plant of the Anderson or French type?

Spadaro: I believe Mr. Gastrock can answer that question more completely than I can.

Gastrock: Many elements are included and must be considered in estimating comparative costs of competing processes. In general, installations for filtration-extraction, size for size, include less equipment, are easier and cheaper to operate, produce products of satisfactory quality, and should be less expensive to install than prepress installations. Further experience with the process is expected to reveal other economies.

Key: Have you been able to check the solvent loss per ton at the Mississippi Cottonseed Products Company Filtration-Extraction Plant at Greenwood?

Spadaro: During our two-week stay at the plant recently when they had just gone on stream, they were meeting the guarantee which I think calls for a loss of less than 1%.

Key: What is the actual solvent loss per ton?

Gastrock: About 4 pounds per ton is the lowest value obtained. The average is a little higher.

Key: In our direct extraction operations our gossypol content of the meal is high compared to the figures just given by Mr. Spadaro.

Reed: How do you account for low gossypol in both the meal and the oil?

Spadaro: Under our conditions of cooking, the gossypol is caused to react with the meal and is thereby converted to bound gossypol. The cooking conditions are such that they do not adversely affect protein solubility.

Reed: Have you investigated cooking at moistures in excess of 12%?

Spadaro: Yes, we have cooked cottonseed at moisture levels between 14 and 25%.

Gastrock: Higher material moisture contents can be and are used in filtration-extraction than in either hydraulic, expeller or prepressing.

Key: How long does the material stay on the filter?

Gastrock: About 2 minutes.

Key: What is the extractor or slurry-mixer retention time?

Gastrock: In our pilot plant runs about 30 to 40 minutes; at Greenwood, between 50 and 60 minutes.

McVey: At Greenwood, are there any meal dust problems?

Gastrock: Filtration-extracted meal runs somewhat denser than other solvent extracted meals. There is some granulation during the process and there is only a small amount of fine powdery meal present. However, it will probably be a good idea to use methods of consolidating the fines in this meal as are currently being used with other solvent meals.

McVey: Have any pellets been made from the Greenwood meal?

Mr. Gastrock: No, I don't think so.

Dr. Pollard read a letter from Mr. Denney to Mr. Gastrock relative to Mr. Denny' inability to attend the conference. Mr. Denney wished everyone in attendance a good meeting and extended his kindest regards.

EXTENSION OF THE FILTRATION-EXTRACTION PROCESS TO VARIOUS OILSEEDS OF THE SOUTH

by

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As a result of our work on filtration-extraction with cottonseed and other oleaginous materials, we feel that three points are clear:

1. Definite principles regarding particle size, diffusion rates, preparation, etc., apply to the filtration-extraction of all of these materials.

2. Success with any oleaginous material will depend upon how well these principles are applied, and

3. An understanding of the basic differences between the various oleaginous materials to be extracted and how to make adjustments for or take advantages of these differences is the most important consideration of all.

The filtration-extraction method has been extended to processing of the following oilseeds:

	Scale of Processing Work	
Oilseeds	Bench	Pilot Plant
Rice Bran	x	x
Soybeans	x	x
Cottonseed	x	x
Flaxseed	x	x
Peanuts	x	
Milo Germ	x	x
Sesame	x	

Proper preparation is the most important step. A properly prepared material must be easily extractible, easy to filter, and relatively incompressible, and must have a reasonable minimum fines content and proper size distribution. The ease of filtration of the material is measured by a term called <u>mass velocity</u>, which is the pounds of solvent per hour per square foot of filter area.

There are five steps in the accomplishment of proper preparation:

1. First determine the extent to which <u>hulling</u> may be necessary. Obviously, hulling would not be used for rice bran or milo germ. Also, as is the case with sesame and flaxseed, when hulls contain much oil, or cannot be removed without loss of oil, hulling

is not done. Whenever possible, hulls should be removed to make subsequent operations more efficient and uniform and to increase equipment capacity. In the case of cottonseed, peanuts and soybeans, some or all of the hulls may be added to the meats prior to extracting or after in order to lower or control the protein content of the final meal product.

2. The second step in preparation is conditioning prior to rolling. The main purpose is to help the rolling operation. Materials with refractory hulls or the hulls of which contain much oil, such as flaxseed and sesame require drying to about 2%. This makes the material more frangible, increases the capacity of the rolls and reduces power consumption. Fibrous materials such as milo germ also need drying. Rice bran needs only cooking and crisping before slurrying and filtration. Enzymes must be deactivated with heat and moisture unless used immediately after milling. Other oilseeds, including cottonseed, peanuts, and soybeans follow a predictable pattern, as follows: Use a moisture content and temperature that is below the plastic range for flaking. This uses a little more power but promotes oil release (not actual oil flow). The optimum moisture content is somewhat proportional to the oil-free, moisture-free content.

3. The third step in preparation is rolling. In this step, we make "little ones out of big ones". 5-high, heavy duty rolls are satisfactory for most of the oilseeds we are discussing. Cottonseed is a special case, the pigment glands must be ruptured or weakened in addition to promoting oil release. Fortunately, the ranges for gland breakage and oil release overlap enough to do both jobs simultaneously. In rolling for filtration-extraction, fines need not be avoided. Cooking consolidates them. The goal is a balanced screen analysis to provide: (1) oil release, (2) rapid extraction and (3) good drainage and washing on the filter.

4. Cooking is the fourth step in preparation. Cooking time is short (15-25 minutes) for very soluble proteins such as in soybeans and peanuts. Longer times (40-60 minutes) are needed for cottonseed and the fibrous materials. Rice bran requires 30-45 minutes. Temperatures need not exceed 225°F. Moisture for most materials must be between 12% and 20%, and for milo germ must be between 30 and 40%. Moisture value is affected by oil content, protein content, protein solubility, starch content, and other characteristics of the material. The functions of cooking are (a) to complete the oil release started in conditioning and rolling, and if possible to put water on the inside and oil on the outside of the particles; and (b) to agglomerate and "make big ones out of little ones". Where protein content and starch content cannot be depended on for agglomeration, a higher final moisture may be used. The final moisture must be about from 10% to 14%.

5. Crisping (evaporative cooling) is the fifth and last step of preparation. 1% to 3% of the moisture is lost during the conveying and screening operations. Screening may be required to take out water balls and hull aggregates which may need some breaking up as by grinding or re-rolling. Crisping gives the cooked particles their relative incompressibility needed for filtration rates that result in high filter capacities. As a result, each particle appears to be separate from the others. A handful when pressed together, can be easily separated.

Extraction commences with the slurrying step. Its purpose is to put the oil into solution at the highest possible concentration. In concurrent flow, one of the filtrates from the filter is the extracting liquid. This filtrate contains initially about 10% oil and 90% hexane, and during the slurrying step the oil concentration may be increased to 30% or more. The time, temperature, agitation, consistency, miscella concentration, and perhaps other factors can be varied. The variables are mostly interrelated.

The filter performs the following functions:

1. It separates concentrated miscella from the solids in the slurry;

2. It refilters this concentrated miscella to reduce the fines content and to produce a final miscella;

3. It provides for an effective, multi-stage counter-current wash in which oil-free hexane is used as the final wash; and

4. It reduces the solvent content of extracted and washed marc to very low values.

In addition, the filter is continuous and automatic in operation. The slurry feed may be flowed on to the filter and an even distribution is aided by the blowback. The blowback, using recycled, saturated vapors from the filter hood, clears the screw of meal particles, once each revolution. A 60 x 60 mesh square weave has been found satisfactory. Five filtrates should be satisfactory for most oilseeds — two for final miscella, to provide for refiltration, and three for the countercurrent washes. Calculations for filter sizes must be made for both solids and liquids to be handled, and for the mass velocity characteristic of the material.

In studying how solvent ratios affect filter operation, the following chart was made, which shows solvent ratios that result for various oleaginous materials with an assumed 30% oil in final miscella. 35% solvent in marc, and no loss.

Material	Oil % (approx)	Meal %	Solv. Meats Ratio	Solv. Meal Ratio	Solvent per 100# of meats In Misc.	In Marc
Rice Bran	15	85	.81	.95	35	46
Soybeans	19	81	.88	1.08	44	44
Cottonseed	32	68	1.12	1.64	75	37
Flax	40	60	1.25	2.08	93	32
Peanuts	45	55	1.35	2.45	105	30
Milo Germ	50	50	1.44	2.88	117	27
Sesame	55	45	1.52	3.38	128	24
Castor	65	35	1.71	4.88	152	19

The ratios are figured two ways, i.e., on the meats and on the marc. Note that the solvent-marc ratio increases much faster than the solvent-meats ratio, as the percentage of oil increases. Since a 1.64 to 1.0 solvent-marc ratio will satisfactorily extract and wash prepared cottonseed it should not require nearly 3 times that or 4.88 to 1.0 to extract and wash castor beans. Thus it should be possible to increase miscella concentrations without affecting extractibility for the higher-oil-content oilseed materials. We are trying to demonstrate this point, which will serve to increase filter capacity for the higher-oil-content materials.

In comparing filtration-extraction with respect to oil and meal desolventization, there are advantages here for other oilseeds as there are for cottonseed. It is likely that the 30% oil in miscella can be exceeded and 35% solvent in marc can be lowered. These advantages will apply to all oilseeds, and will result in savings in solvent evaporating costs and in increased capacity of equipment. Conventional oil and meal recovery equipment can be used in the filtration-extraction process.

With reference to oil and meal quality, the filtration-extraction process uses lower temperatures and shorter processing times than other processing methods. These two factors contribute much to product quality. They are under good control in the process and means are being sought to improve the control further.

In closing, this general statement can be made. In processing a variety of oilseed materials, the filtration-extraction process presents a wide choice of favorable combinations of operating conditions, thus making it possible to select processing conditions for various oilseeds that favor economic and efficient operation and high product quality.

Discussion

Allen Smith: In regard to rolled meats, how much water do you add to get flakes of 0.010 inch thickness?

Gastrock: You want the meats at a moisture content below the plastic range. The amount of water varies with different oilseeds. With cottonseed about 8 to 10 percent can be used but that probably varies with different cottonseeds.
Allen Smith: We are adding water ahead of our rolls and you can add too much. They roll all right and the rolls can take the wet meats, but we can't get good extraction results with them.
Gastrock: Use of rolls for filtration-extraction is very much akin to their use in screw pressing. In both cases, work must be done on the meats to prepare them for oil extraction. The moisture should be added far enough ahead of the rolls to obtain the maximum degree of equilibration.

REPORT ON SURVEY OF PROBLEM OF CLEANING COTTONSEED AND LINTERS AND PRELIMINARY EXPERIMENTAL RESULTS

by

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The problem of cleaning cottonseed and linters has received considerable attention at various meetings held at this Laboratory during the past two years.

As a result of conferences between officials of the Valley Oilseed Processors' Association and officials and section heads of the Southern Laboratory, a survey was initiated early in 1953 to determine the extent and seriousness of this problem and the possibilities for technical solution.

Following visits to eight oil mills, three gins, one linters pulp plant, and three equipment manufacturers in the Delta and West Texas Regions, a preliminary working report was prepared and submitted at the Second Valley Oilseed Processors' Clinic, March 8-10, 1953. This report was also submitted later at your Fifth Annual Convention held here on March 16-17, 1953.

Additional survey information was obtained during our attendance at the 21st Annual Short Course for Oil Mill Operators at Texas A & M College, May 25-28, 1953, and it was at this meeting that we submitted our initial progress report of exploratory work on cleaning cottonseed.

Although our work on this problem started in January, 1953, with the survey and a hastily constructed traveling belt, efforts thus far have centered mainly on the accumulation and evaluation of data for a more complete survey report. We have, however, completed several exploratory runs on the traveling belt method for removal of all trash from cottonseed, and have also completed our preliminary designs for an exploratory model of a device for removal of sticks from cottonseed.

Our survey report has been compiled and is now in process of review. Because of the wide divergence and quantity of material collected and the time required for editing the report, we could not have it ready for distribution at this meeting. However, it should be ready for distribution within the next few months.

We are now presenting a preliminary report on our findings and recommendations. A more complete list will be included in the final survey report.

Insofar as extent and seriousness of the problem, the survey reveals the following:

(1) The Delta and West Texas Regions of the cotton belt are now undergoing changes in harvesting methods, which, in most cases and during an appreciable part of the season, cause significant increases in foreign matter content of seed cotton.

(2) The trend in harvesting is unmistakably towards rougher methods. Approximately 63% of the 1952-53 crop was harvested by hand picking as compared with 71% for the 1950-51 crop. There has been an increase in mechanical harvesting from 8% of the 1950-51 crop compared with 17-20% for the 1951-52 crop. Sufficient mechanical harvesters were available in 1952 to harvest 5,000,000 bales. The number of spindle pickers was also estimated at approximately 12,000 units in 1952, as compared to about 7,300 in 1951. Strippers increased during the same period from 15,000 to 20,000 units.

It is interesting to note that 85% of the California crop for 1952-53 was harvested by mechanical pickers, whereas 15% of the Delta region was so harvested.

(3) Since the cotton gins are obliged to satisfy the farmer demands for highest possible return for his lint cotton (value about 4 times that of cottonseed) they are frequently limited in the extent of cleaning that could be done, by the necessity of producing lint cotton of optimum quantity and quality. Thus, a high degree of trash removal from the seed cotton from the ginners point of view might not be generally desirable. Thus a variable quantity of trash can be expected in cottonseed delivered to oil mills.

(4) From an overall point of view, existing seed cleaning equipment in oil mills in most of the belt is incapable of reducing the foreign matter content of cottonseed, during the latter half of the season, far enough to insure a feed to the delintering machines low enough in trash content that will not seriously affect the quality of the linters produced.

The reports on linters and cottonseed quality indicate that, in general, for years 1946-50:

(a) The proportion of chemical grades of linters to all grades varied between 55 and 72%.

(b) The proportion of "off-grades" of chemical linters in the total of all grades (including off-grades) varied between 13 and 21%.

(c) The proportion of chemical "off-grades" to total chemical grades (including "off-grades") varied between 13 and 31%.

(d) The proportion of chemical "off-grades" to the total "off-grades" (of all grades) varied between 55 and 72%.

The proportion of cottonseed that might be considered as causing difficulties in maintaining grade in linters is estimated at 1/3 of the total production.

(5) Significant statement of the present situation relative to oil mill equipment was made by one of the industry's leaders as follows:
"The whole thing boils down so to speak to this. It could be stated bluntly that our system of seed cleaning equipment desperately needs drastic changes in design or a new approach to the problem of cleaning cottonseed. To me, this is forcibly brought to light when you find 50-55% total foreign matter removed is, in most mills, considered the best we can do today in cleaning trashy cottonseed."

(6) It is the concensus of opinion that existing linters cleaning equipment is generally satisfactory and will be capable of doing an even better job when improved or new seed cleaners are provided. The emphasis should now be placed on devices for seed cleaning.

(7) Increase in use of wood pulp in lieu of cotton linters pulp in production of chemical cellulose is due principally to the following reasons:

(a) Supply is limited mainly to size of cotton crop. Supply of wood pulp is not so limited and can be expanded as demands are made.

(b) Price structure is not stabilized to the point where it could be competitive with wood pulp. Fluctuations in price, as compared to those of wood pulp cause concern and hesitancy on the part of users making end-products that are in a highly competitive field.

(c) Quality of linters is not consistently high from several standpoints, chief among these is the amount of certain types of undesirable foreign matter. At times, this is so objectionably high that it causes difficulties in certain major chemical uses of second-cut linters.

Quality of wood pulp is improving at a tremendous pace, and the quantity will soon be increased, with new plants now being completed, to more than supply foreseeable needs of the industry. Considerable research effort is now being expanded by the wood pulp chemical cellulose interests in finding new and improved uses for their product. A number of new uses for chemical cellulose will probably make their appearance on the market. In fact, an entire new field of chemistry has been unfolded -- this field of chemistry is known as Silvichemicals or chemicals from wood.

Due to the fact that wood pulp can now be used in the preparation of cellulose having alpha cellulose content very close to that of the highest grade chemical cellulose made from linters, wood pulp will very likely absorb any new product that is produced using cotton linters as a raw material. For the present, it is suggested that new uses for linters should therefore be based principally on their physical properties or modified chemical and physical properties in order that wood pulp may not absorb them.

(8) The present competitive position of cotton linters is summarized by the following statement from a leader in the industry. "If we do not make drastic improvements in the quality of chemical linters, they will be entirely supplemented by wood pulp within the next few years. To many of us this threat of wood pulp was an old story and in past years it may have been just that, but we are now convinced it is no idle threat. Wood pulp processing has improved to such an extent that many consumers of pulp now prefer it to linters and to such an extent that it must contain less trash than the finest quality chemical lint we have ever produced."

Insofar as chances for technical solution of the problem are concerned, the survey reveals that:

(1) The major oil mill associations have been focusing their attention on this problem since 1952. Their committees have made progress in attempting to hold present linter quality, but no definite solution to the overall problem is yet in sight.

(2) Manufacturers of seed and linters cleaning equipment are making contributions both direct and cooperative to improve existing equipment to relieve the present burden on the oil mills. Not many long range research and development efforts are being aimed at entirely new methods of cleaning cottonseed or linters.

(3) Very encouraging results are being obtained by the U. S. Cotton Ginning Laboratory in their efforts to further reduce the foreign matter content of <u>seed cotton</u> before it enters the gin stand, and the reduction of foreign matter content in <u>cottonseed</u> resulting from their efforts is very helpful, but it is not likely that complete removal of all types of linter degrading foreign matter will be effected at the gins.

(4) Removal of foreign matter from cottonseed as it is received at the oil mills and before storage would be of great benefit to the seed crushing industry and to users of cotton linters. All groups working on the problem should keep this fact in mind when considering possible use of new principles for seed cleaning.

(5) Until seed can be cleaned as received at the mill, work must continue to improve existing seed cleaning devices or provide new devices to clean seed in the course of normal mill operation.

(6) The extent and seriousness of the problem justified preparation of this survey report. The authors as well as officials of the Southern Regional Research Laboratory have recommended a survey report and exploratory work be undertaken on seed and linters cleaning, and the results be furnished the industry. Work on new methods for seed cleaning with available personnel will follow the survey report and preliminary exploratory work.

As a result of this survey we are making the following preliminary report of recommendations:

(1) That oil mills now consider the problem of cleaning linters as primarily one of cleaning cottonseed.

(2) That the problem of cleaning cottonseed be considered an oil mill problem. It is not intended that assumption of this responsibility by oil mills should cause relaxed efforts on the part of ginners to improve seed cleaning. Ginners are guided mainly by the cleaning operations on lint cotton. This might or might not preclude removal of all trash from cottonseed.

Further, from an overall point of view, it would be more economical to provide cleaners at oil mills instead of at gins for the following reasons:

(1) The greater number of gins compared to the number of oil mills. Approximately 7,500 gins to 235 oil mills.

(2) Gins operate for shorter periods than oil mills. Approximately 10 weeks as compared to 6-10 months.

(3) Generally, the foreign matter content of seed usually increases as the season progresses, and the feasibility of installing a seed cleaner at any one gin would have to be determined more or less individually, and would involve a study of present harvesting methods as well as possible future trends. Thus, in any one locality, some gins might be in a position to turn out seed with less foreign matter than others in the same general locality. Since oil mills in some cases receive their seed from many scattered gins, it is possible then that one oil mill might receive severalshipments of high foreign matter content seed, which, when conveyed to storage, would raise the overall foreign matter content of an entire storage bin or tank of seed.

(3) Cleaning cottonseed as received at oil mills and prior to storage would benefit the industry. A few of the advantages follow:

(A) <u>Decreased hazards of storage</u>. Accumulation of excess amounts of foreign material in seed has been reported in some instances to be the cause of overheating.

(B) <u>Increased efficiency of crushing</u>. This is usually accomplished through increased seed throughput, decrease in loss of linters during cleaning, less oil absorbed by foreign materials.

(C) <u>In some instances, increased quality of products from cottonseed</u>. Foreign matter content, if low, will contribute both directly and indirectly to grade increase in linters. In addition, reduced rate of increase in free fatty acid content during storage will minimize oil loss.

All groups interested in providing seed cleaning equipment for oil mills should appraise proposed new cleaning methods with this thought in mind.

(4) Long range plans should be made <u>now</u> with objective to provide seed cleaning devices for oil mills that will insure virtually clean seed to first-cut linter machines even with straight run seed ginned from late season stripped or sledded seed cotton. This will provide a margin or factor of safety in seed cleaning that is practically non-existent in the industry today. Further, linter machines will go back to the job they were originally intended to do, and they will, in turn, no longer be considered as cleaners, nor will they create the added cleaning job linter beaters are now doing. The latter, relieved of the burden of removing both the naturally occurring and linter-manufactured trash, should do not only a much better job of cleaning linters, but do so with much reduced loss in linter quality and quantity.

(5) Every effort should be made to find new markets for linters. Emphasis should be placed on uses that cannot be absorbed by wood pulp, i.e., uses that will take advantage of existing or modified physical chemical properties. Aside from the possible new uses based purely on existing physical properties, new uses based on existing chemical properties might include products obtained from second-cut linters at the various stages in their chemical processing up to a point just short of the dissolving step. Linters modified chemically only to the point of enhancing certain properties without destroying their original shape could include: Flameproofing; increasing water resistance, stiffness, elongation, water solubility; and resistance to rot and heat. Other new uses might include either partial or complete coating with synthetic rubber, bituminous or other material, in order that moulded resiliant shapes could be produced that might compete with foam rubber, etc.; and use for moulded products wherein additives and coating materials could include cottonseed protein glues, plastics, etc.

Every effort should be made to determine properties desired in linters for existing and new uses in order that work can be directed along these lines.

(6) Another survey should be made in connection with the use of linters for high grade paper. Competent authorities on this subject and in related fields should be consulted and recommendations submitted to the cottonseed crushing industry.

(7) Upon completion of the present survey report, the Southern Regional Research Laboratory should continue to keep abreast of not only the seed and linters cleaning problem, but also the overall linters situation. In this manner the rate of progress in the solution of the problem, as well as significant trends in the overall situation and their effects on the industry, will be known. In addition, every effort will be made to expand our exploratory work to try some of the new approaches to a solution of the problem that have been submitted.

(8) The industry should continue their cooperative efforts to solve the problem through oil mill associations, universities, governmental agencies, and manufacturers of oil mill equipment. Now that interest has been aroused in this problem and many groups are at work, results should be obtained soon.

<u>Progress report on preliminary experimental results obtained in cleaning cottonseed.</u>

<u>Preliminary results of exploratory work on the traveling belt</u>. The traveling belt experiments are now in progress, and results obtained thus far are too few to furnish a basis for evaluation of the idea. The following remarks are therefore made only with a view of providing some knowledge of the general trend the work is following:

Using a 3-foot wide, 10-foot long canvas belt operating in a horizontal position with 5 scoops located immediately above it to catch the seed that bounce, and two fractions of seed that are conveyed off the belt, the following was noted:

(a) Seed collected in the scoops contained less foreign matter than seed conveyed off the belt.

(b) Most of the sand, fine field trash, lint, and grabbots were thrown immediately forward of the conveyor.

(c) Clean sound seed with minimum lint was thrown the greatest distance from the conveyor.

(d) Seed, usually with some lint attached, sticks, burrs, and other trash fell between fractions described in (b) and (c).

With speeds at 2650, 3970, 4800, and 6880 ft. per min., for any one series of runs, and conveying over initially 100 pounds of seed, previously freed of grabbots and large field trash, the clean fractions, i.e., those in the scoops and that at the greatest distance from the conveyor, were recycled until little or no reduction in total trash content was observed. The final minimum trash content after 3-4 recyclings was about 0.5 percent in a sample of about 20 pounds, and this seed contained sticks of small diameter and of length approximating that of seed. No appreciable reduction in trash content of this fraction could be achieved at any of the speeds tried. Likewise, the remaining two trashy seed fractions were recycled until no further increase in trash content was noted. In practically every instance a condition was reached after 2-3 recyclings wherein the partially ginned seed and sticks and other trash resulted in a matted condition such that the entire mass could be raised with the thumb and forefinger alone. This usually occurred at a total trash content of about 10 percent and the sample usually reduced to a total weight of about two pounds. Further recycling, though carried out by separating the mass by hand, raised the trash content to as high as about 29 percent but many partially ginned seed were in the mass.

Thus as present trends indicate, devices may be necessary to remove the seed from the final stages mentioned, before one fraction containing pure seed and another containing all trash can be obtained. Possible use of air separation to remove the 0.5 of fine trash may be suitable for the clean fraction and further ginning and stick and burr removal may clean up the final "trashy seed" fraction. Our string device for removal of sticks may prove suitable for use in this separation.

It must be recognized that these results are based on one position of the belt and one type of belt. Drastic differences in results may be obtained using a belt of slightly different texture or by changing the angular position of the belt. Only trial of these variables will tell the story.

Discussion

Stevenson: Do foreign linters offer any quality advantage over domestic production?
Holzenthal: Yes, the latest report of the National Cotton Council says that foreign linters are longer and more resilient.
Stevenson: What is the reason for the linter difference?
Holzenthal: It is the different cuts that they make.
Stevenson: What is the chemical linter picture?
Holzenthal: Our chemical linters are being pushed out by wood pulp.
Stevenson: Do we have a quality advantage for linters in chemical use?
Holzenthal: Yes, we do. If the price and quality were right and a definite supply always available, the industries would much prefer to use linters over wood pulp.
Pollard: If the cottonseed were cleaner, would linter cleaners be necessary?
Holzenthal: Yes, they would be, because cleaners also remove hull pepper and other material caused by the lintering operation.
Holzenthal: Would it be feasible to remove seed after the first linter cut, clean them and then make the second linter cut?
Frazier: It is being done that way now at Osceola.
McVey: With the present price of linters (3 cents per pound) it would be better, if we could, to process the seed without delintering.
Unkown: Too much oil would be lost that way.

March 16, 1954 - Morning: Chairman, Dr. W. W. Fetrow, FCS

ANALYSIS OF OPERATIONS

by

D. H. McVey

Farmer Cooperative Service

Copies of the following reports were distributed and some of the highlights discussed:

1. FCS Advisory Report No. 7 - "Report to Managers and Directors of Cooperative Cottonseed Oil Mills in Regard to Operating Results for the 1952-53 Season"

2. FCS Advisory Report No. 8 - "Labor Utilization in Cooperative Cottonseed Oil Mills, 1953-54 Season"

3. FCS Advisory Report No. 9 - "Sampling, Extraction Efficiency and Product Analysis for Cooperative Cottonseed Oil Mills, 1952-53 Season"

4. FCS Advisory Report No. 10 - "Electric Consumption and Power Rates at Cooperative Cottonseed Oil Mills"

Copies of these reports have been furnished the mills and discussion of the data is not presented here. Considerable more time was spent in discussing these reports this year than in any previous year. Particular attention was devoted to a comparison of the operating results; to labor requirements and wage rates; and to the extraction efficiency data and product analysis.

The group asked that the same sort of information be obtained for another year and that the following additional data would be helpful:

1. Under outturn of products, show the breakdown on linters into first cut, second cut and motes.

2. Show solvent as a separate cost item in the breakdown of manufacturing costs.

3. On protein content of meal, use the analysis of car lot shipments and not production analysis.

4. Obtain moisture on carlot meal shipments.

5. On oil analysis obtain refined color and bleach as well as refining loss.

6. On lint analysis, obtain cellulose content, also obtain available lint on the seed as sampled, since this will apparently be a grade factor in 1954.

A summary of the operating data by type of mill and area was promised the mills as soon as it can be prepared and reproduced.

March 16, 1954 - Afternoon: Chairman, Dr. W. W. Fetrow, FCS

A UNIFORM SYSTEM OF ACCOUNTS FOR COOPERATIVE COTTONSEED OIL MILLS

by

C. R. Rathbone
Controller, Ranchers Cotton Oil

Mr. Rathbone distributed a copy of a proposed form "Statement of Operating Expenses". The form is not reproduced here since copies have been sent to each of the cooperative mills. The form was drawn up after examination of the chart of accounts of each of the mills and the form now used by the cooperative soybean mills.

The use of the form does not contemplate changing the books or records of any mill to any appreciable extent. The information on the form is already available on the books of the mills with minor exceptions. It is designed to cover only the production of cottonseed products from a ton of cottonseed. It would not include refinery operations, mixed feed cost, etc. It would be filled out by each mill to accompany the official audit report. Summarizing the data from the form would make the expense figures comparable and much more meaningful to the mills which has not been the case in the past.

After considerable discussion, it was decided that the form should be completed by each mill and should accompany the audit report. It was also decided that the form, initially, at least, would not be used for a periodic progress report. With respect to the definition of the items on the form, Mr. Rathbone was asked to compile a definition of each account and circulate it to each of the mills for comments. A final draft would then be sent to the mills for their use. This should be done soon so that necessary bookkeeping changes can be made before the start of the 1954-55 year.

PROBLEMS IN MARKETING LINTERS

by

Ralph Woodruff

Manager, Osceola Products Company

This afternoon I should like to try to give you in condensed form a summary of what we have learned in two and one-half years of work with the Valley Processors Research Committee on the problem of marketing linters and the attendant proposition of making a marketable lint. This is a very wide subject for it covers in scope, territory where cotton is grown, from the Atlantic to the Pacific. Differences in climatic conditions, differences in varieties of cotton grown and differences in methods of harvesting in various areas, complicate this problem. As you see, there are some thirteen mills represented here, ranging from mills on the West Coast to the Mississippi Valley, and we find in our little group of cooperative mills that we have many problems that are different in different areas. When you consider that there are 343 active cottonseed oil mills in the United States today, you recognize that the problem of manufacturing salable lint is not necessarily the same in El Paso that it is in the Mississippi Valley. Even so, we made a better product in 1953-54 than we did in the 1952-53 season and we had improved our position somewhat in 1952-53.

You may recall that I have stated before that in November 1951, a group of mill men in the Memphis area were having lunch in Memphis. At the time we were having a great deal of difficulty selling lint. We had a very heavy bolly seed run that year and it seemed a matter of impossibility to make a desirable first cut or chemical lint. One man of the group made the statement that he would like for somebody to tell him how to make a lint that would sell. He had some lint on hand at that time that he had not been able to market and he was making more of the same kind of lint.

When we began to compare notes we found that everybody was in somewhat the same position. That is the time we began to try to do something about it.

To find a starting point, it was necessary to gather information as to what constituted a desirable lint. It was necessary for us to try to learn what characteristics the manufacturers desired. We set out to try to get the manufacturers to set up standards that we might use in our manufacturing process. We had another meeting of the mill men and a number of representatives of manufacturers and linter dealers. By manufacturers, I mean manufacturers of bedding, mattresses, automobile batts and furniture upholstery. We also had representatives from the chemical trade at this meeting. We gathered from the discussion at this meeting that various uses of linters required various types of linters.

We found that the chemical industry, generally speaking, needs a clean uniform quality second cut free from heavy shale and other foreign material. This shale and foreign material will not dissolve in the cleaning process. Small pepper trash is contained to some degree in all second cuts and while usually this will dissolve in the chemical process, it results in the loss to the oil mill and bleacher in lower cellulose content and usually should be kept at a minimum. However, pepper trash is not usually taken into account by the bleacher in the determination of quality of chemical lint as to its acceptability on a contract. Therefore, this second cut classification or qualification narrowed itself down to trash content. We then desired or needed a mark beyond which we could not go and up to which lint would be acceptable to the chemical trade.

This quality standard now seems to be pretty well defined as a tolerance of a "slight excess" foreign material. By "slight excess" we mean "slight excess" on the basis of the United States Standard Grades for American Cotton Linters. This would correspond to "excess trash regular" on the 1953 cottonseed products purchase program basis. Anything below these quality standards would probably be rejectable and most certainly questionable. As a consequence, we have learned that any lint that is acceptable to the chemical trade will be acceptable under the Government program. Of course, we had to at all times take into consideration the fact that we were doing business, at least to some extent, on a controlled market or a supported market. As long as we were supporting cottonseed, it was necessary that we not lose sight of the fact that the final disposal of a large part of this lint might necessarily be to the United States Government. I believe this pretty well covers this situation with reference to quality standards for chemical lint.

I have set-forth already the principal non-chemical uses for cotton linters which are: bedding, automobile batts, furniture upholstery, etc. Smaller quantities of linters are used in the manufacture of battery boxes, pharmaceutical supplies, linoleum, etc.

We found that the desirability of certain characteristics of first cuts varied with the use of the linters. For instance, the mattress manufacturer is not particularly concerned with color and is more interested in a clean, fairly average staple, harsh, first cut-about a 2 low or 3 high. That is:

The manufacturer of the better grade mattress. The low grade mattress manufacturer who would use lower grade lint, still desired a harsh lint and could use a lint with a little more trash. Since his product was cheaper he had to buy the lint cheaper.

The linters are usually blended with reworked waste with some staple. These blends vary of course. For the mattress manufacturer color is desirable but it is not a prime requisite.

One point that was continually emphasized at the Memphis meeting of the linter people and the mill men was the desirability of a clean lint and the elimination of waste. It seems to be somewhat akin to the trash in staple cotton. The trashier the lint the higher the waste; and the waste in poundage in running thru the Garnett machines, seems to be quite considerable, in some cases. I remember that many years ago when I used to fool around with cotton a little bit, a mill man pointed out to me that if the trash in the cotton, particularly the bolly cotton, was the only loss that they had; it would not be so bad but, in eliminating the trash (cleaning the trash out of the cotton) they took a lot of the cotton with it, and that seems to be the case in the Garnetting of these first cut linters. I know that time and time again someone in the bedding or in the dealer trade would again reiterate that the thing they wanted was a fairly clean lint, one that would not give them so much loss -- not create so much loss of lint <u>itself</u> in the Garnetting.

Now as to automotive batts. Again it was a surprise to me to learn that the felt used by this industry will range in grade from a very high grade felt in the expensive cars to a very low grade felt for the cheap cars. Therefore, it is necessary to make many blends and many qualities. We were indebted to Mr. Marion Mann of Atlanta, Ga. for a great deal of the information presented us as to the desirability of various types of linters and Mr. Mann appeared on the program here in February. Now he listed as the desirable characteristics, for the automotive trade:

No. 1 - Color
No. 2 - Body or Harshness
No. 3 - Staples

He listed them in that order. He said that color is very important in making the sale of these batts and it is seemingly considered a measure of grade - the whiter the batt the easier to sell.

Mr. Mann said the body of the lint is very important in making a high grade batt as this body (or character) gives much better filling qualities for the finished felt pad and prevents the <u>break down</u> of the cushions and the pads.

In his statement he put staple third, which was surprising to me but he went on to point out that the manufacturers of automobile batts say that they can get staple from waste products at a cheaper price than they can afford to pay for long staple lint and until good staple linters are produced at reasonable prices, they only require enough fibre for smooth carding and minimum loss in shrinkage. Therefore, if the staple of the first cuts were improved, unquestionably, they would be used more in the place of waste, provided again prices were competitive.

The automotive trade will use low grade first cuts, mill run, or even second cuts, in their cheaper batts, but harshness is also a desirability for these batts.

Now let us consider the furniture trade. Again, we have numerous grades of felts for various qualities of furniture. Here, as well as in all other fields, the competition with other substitutes is such that manufacturers make the best possible felt at the cheaperst possible prices consistent with the quality specifications.

Here staple is a prime requisite and probably number one on the list, character or harshness number two, and color number three. Of course, all of this lint must be reasonably clean and free from foreign material. Here again, we found that the better the furniture, the better the batt, and the better batt, the better lint required. Batts for lower priced furniture will contain a certain amount of mill runs and low first cuts but even in this lint, harshness is a desirable quality.

I am not going to try to cover the battery box and linoleum industry any more than to say that both these uses require a clean second cut or mill run of better than average cleanliness and must have enough fibre to serve as a binder for these purposes.

Now we have covered the desirability of characteristic's of linters for various purposes; let's see what we can do about it.

There is not much you can do about character or harshness for character is controlled by climatic conditions in the growing area. It was very much of a surprise to me to hear one of the representatives of the big bedding interests - one of the name brand mattresses (in fact the highest price bed and mattress I suppose that is sold on the market today) - say that it was no longer possible for him to obtain in the Mississippi Valley the type of first cut lint that he had to have for his beds on account of deterioration in the character of the lint, largely, he thought, because of change in varietal standards. It is now necessary for his company to go to West Texas and California to obtain the harsh character of lint that they had to have in their mattress even though his factories were situated in the East and it represented a considerable additional outlay of freight to bring this lint from California to his factories. Therefore; let us concern ourselves with the things we can do something about. One thing we concluded was; that the day when we could cut a 90 pound cut and call it a high grade first cut was gone. We also learned that there was a large portion of this high cut, low staple, first cut lint hanging over the market and a lot of it was apparently in Government hands.

We also found ourselves right back to the proposition of cleaning up the seed and cleaning the lint. We corroborated everything we had concluded or surmised previously. So we began to compare notes and began to try to work out of our difficulty.

We concluded that most of us had about half enough seed cleaning equipment. That where most of us were running 75 to 100 tons over a Bauer Brothers #199 cleaner, we should be running from 35 to 50 tons over each cleaner. Some of us bought additional cleaning equipment and the results were immediately apparent. In this area, where we still use sand and boll reels, by looking at what the other fellow was doing, and comparing results, we found that we could improve the work that the reels were doing. We improved our shaking equipment under these reels and began taking out considerably more fine foreign material than heretofore. There were several installations of the carver brushless devices made and the improvement of the quality of the lint was noted. The use of the Whirl-A-Gig in the lines between linters and the cleaners was noted and the results were compiled with considerable interest. It was found that any point where you could take trash out of the lint you were improving the quality of the lint regardless of the means. One installation of the basket type beaters on the first cut linters was made in the Mississippi Valley. That was at Osceola, and the results there have certainly been gratifying. We also installed the Whirl-A-Gig in the line. We had done that three years ago and have been getting good results. We have mentioned before, we installed two additional Bauer Brothers #199 machines. We began to make some comparison of saw filing methods, particularly on first cuts, and we found that various changes in the way we were filing our saws would sometimes improve our lint. All of these discussions have been recorded. These reports have been recorded and they will be published. I could not cover all of them this afternoon. I will say that it has been a great deal of help to us at Osceola to be in on these discussions. We have had no trouble with lint this year. We had less trouble last year. We have taken bolly seed -- straight bolly seed -- and run them through and made a prime chemical lint and a marketable first cut and that is something we have never been able to do before. I would suggest that you watch these publications and that you pick out from any of this material something that you think might apply to your own situation. You cannot set up a pattern that will cover the entire United States, but you may be able to gain something that will be helpful to you in your own situation.

March 17, 1954 - Morning: Chairman, Dr. W. W. Fetrow, FCS

PROBLEMS IN SEED PROCUREMENT (Panel Discussion)

by

Otho Key, Assistant Manager
Plains Cooperative Oil Mill

The mill is owned by 65 cooperative gins. They advance the market price for seed and buy on the basis of grade. The use of the area grade last fall, where the gin had to buy from the grower on the basis of the area grade, caused considerable confusion among gins. The mill does not set the price but follows the price set by the competition. They do not employ a field man

but the Manager and Assistant Manager visit the gins during the harvest season and talk over their problems. They never ask the gin to send seed to the mill, it is assumed that the seed automatically go to the mill. Gin managers are asked to call the mill if they receive offers of higher prices. If the mill can't satisfy the Manager, they may ask for a meeting of the Gin Directors. Most of the time they are able to work out the problems.

They believe that much of their success is due to the way they work with the Board of Directors of the mill. This Board is composed of a member from each gin who is selected by the Board of Directors of the gin. The mill board meets monthly on a fixed date at which time all problems concerning the mill are discussed and a copy of the financial report given to each gin. Thus, the members are kept informed. A fee of $5 is paid each member in attendance and a free lunch is served. They encourage the gin managers, directors and members to come to the mill as often as possible. A representative of the mill always attends the annual meeting of the gins, if at all possible.

At times they have helped new gins to get started by putting in some capital. A basic requirement is that there must be a need for the gin. They advance operating money to the gins in the fall on open account. Interest is charged at 4½ percent. They feel they have to do this to meet competition from other crushers.

Gins are encouraged to leave their seed money at the mill. They are paid 3 percent on this. A credit memorandum is sent to the gin at the end of each month. It's one more way to tie the gins to the oil mill and maintain seed volume. They have been able to pay some cash dividends and are revolving their preferred stock.

W. R. Sanders, Manager
Cen-Tex Cooperative Oil Mill

They operate a small mill owned by 15 cooperative gins. Each gin has a member on the oil mill Board which meets every two months. Directors are paid $10 plus 5¢ mileage.

Seed are not bought on grade but the market price is paid. The price is set by competitors and Cen-Tex follows that price.

The seed at the member gins become the property of Cen-Tex and the gin is not allowed to dispose of the seed to anyone else. If the mill can't take the seed, due to inadequate storage, and storage space at the gin is full, the mill and not the gin sells the seed to relieve the situation.

The mill tries to work through the gin Manager and most of the time is able to do so. However, it is sometimes necessary to go to the gin Directors. It is necessary to work with the gins continuously and visit them often, mostly in late afternoons and at night.

Clyde Grice, Manager
Mid-West Cooperative Oil Mill

The association has a small mill owned by 32 cooperative gins. They advance the market price for seed and buy on grade.

Their problem is greatly aggravated by a three year drought which has left not only the producers but the gins in debt. Competition often offers the gin more than the market price and more for the seed than the mill can afford to pay. This puts the gin on the spot since they need the money so badly. Competition also loans money to the gins very freely which the mill is not in position to do.

Each gin has a member on the mill Board of Directors and they meet monthly, on a fixed date. The mill Board wants to pay out all savings at the end of the year. They don't realize what they own in the mill.

Due to the drought and resulting seed shortage coupled with extremely stiff competition, the mill volume has not been sufficient for an efficient operation and savings have not been as high as they could have been. It's a continual battle to keep the gins loyal and get them to deliver their seed. The end of the drought and a good cotton crop or two would help a lot.

Comments from Other Mill Representatives

F. M. Vining, President
Valley Co-Op Oil Mill

They are a new organization in oil milling, owned by gins. They are not in position financially to pay out cash at the end of the year, as yet. They pay the market price for seed, less $3.00 per ton. Two dollars of this is an operating capital retain and $1.00 is a capital retain. By the end of the season, they have been able to return the operating retain. Since they have not paid cash dividends, they have found it necessary to keep members reminded of the conditions before the mill was built and how much the mill has meant to them in the way of increased seed prices.

They also try to work with the gin manager but sometimes have to go to members of the gin Board and even to the gin membership. If possible, a mill representative always attends the annual meetings of the gins and, if the opportunity is presented, talks about the operations of the mill.

R. A. Graham, President
Ne-Tex Cooperative Oil Mill

Their mill is owned by some 40 cooperative gins. They advance the market price for seed. They extend credit to the member gins. Through their long years of experience, they have found that they must stay close to the gin manager. He is the key man in the gin organization. With all their work along this line, they still have problems.

A. L. Hazleton, Manager
Producers Cooperative Oil Mill

They have used Director's clinics as an effective means of training and maintaining good membership relations. They use the Wichita Bank for Cooperatives, Oklahoma Extension Service, Oklahoma Cotton Cooperative Association and Farmer Cooperative Service personnel in these meetings. They also have a field man to help the gins with their problems. He is not a seed buyer.

Ralph Woodruff, Manager
Osceola Products Company

Their mill has 34 members composed of 7 cooperative gins and 27 independent gins. The mill Board meets monthly at a fixed time. They have no non-member business. The initial problem is to sell the prospective member on membership in the mill and to sell him stock in the mill. After this, they pretty well stick with the mill. To maintain the membership and seed volume, it is necessary that the mill Board have confidence in the Manager and that the membership have confidence in the Board. It's a slow process but is sound. They buy on the basis of grade and advance 90 percent of the market price for seed at the time of delivery but the other 10 percent is set up on the books as a credit to the member and is paid to the member at such time, during the milling season, as the financial condition of the mill warrants. One of their problems is to keep from paying out all the dividends in cash with the resulting failure to build capital.

E. F. Chavanne, Vice-President and Secretary
New Orleans Bank for Cooperatives

Mr. Chavanne briefly explained the set-up at the two mills that the New Orleans Bank finances:

1. Minter City, Mississippi

It is the oldest of the cooperative mills and over the years has gained the confidence of the people. They advance up to 80 percent of the market price and do not grade. Final payment is at the end of the year.

They have a waiting list of members and during heavy seed production years they put members on a quota since they can crush only around 40,000 tons. Seed procurement is no problem at this mill.

2. Delta Oil Mill

This is a much younger mill than Minter City. Members put in considerable initial capital. They have been improving and expanding their crushing facilities and need more seed for an efficient operation. They used to advance 80 percent of the market price but advanced 90 percent for the 1953 crop and advanced 100 percent to some new members in order to increase their seed volume.

C. R. Rathbone, Controller
Ranchers Cotton Oil

It was pointed out that Ranchers is a new mill. They have a marketing agreement with the member gins and they must deliver all their seed to the mill. Somewhat less than the market price is advanced at the time of delivery and payment is made to the gin at the end of each month. Their Board of Directors is composed of a representative from each member gin and he cannot be the gin manager. Gin managers are expected to attend Board meetings but the Directors always have an executive session. Capital retains have had to be heavy and this has hurt many of the producers from an income tax standpoint. They hope to lengthen the revolving period and be able to pay some cash dividends. A question was raised in regard to whether member gins sent all their seed to the mill. Mr. Adair said it was true except for very small amounts that the grower might take home for planting seed or feed. He went on to explain that they gin only for members and the marketing agreement requires them to send all seed to the mill. Also, with the large investment that the gin had in the mill, they could not afford to send the seed to any other mill. They hope to pick up additional members and maintain seed volume in spite of the acreage cuts.

Ed Breihan, Assistant Manager
Farmers Cooperative Oil Mill

Their membership is composed of individual farmers. They do not work at all with the gin managers, even at the cooperative gins. The individual producer tells the gin where to send his seed. The mill advances something less than the market price for seed. The gin makes the initial advance to the grower but the final settlement is by the mill directly to the farmer. Mr. Breihan believes, and the group agreed, that if a mill can get by in making an advance for seed, it is a very effective weapon against competition. Confidence in the mill is highly important in a situation of this kind.

Meeting For 1955

Considerable discussion took place regarding the possibility of hol[illegible] 1955 meeting in some location other than New Orleans. It was the op[illegible] the group that any other location that might be selected should be cl[illegible] a mill that could be visited by the group. This would probably restric[illegible] location to an area with a cooperative oil mill. Laboratory people wou[illegible] expected to participate in such a meeting as they have in the past.

Mr. Vining made a motion, seconded by Mr. Woodruff, that a committee be appointed to select a meeting place. The committee should give consideration to visiting a mill where important developments are taking place that would be of interest to the group. The committee selected should have representation from the Delta, Texas and California. Motion carried. The Committee selected was:

Ralph Woodruff	- Delta
Otho Key	- Texas
C. R. Rathbone	- California

Mr. Key was elected chairman of the Committee.

The meeting group thought the Committee should decide fairly soon on a meeting place. They also selected the above Committee to serve as the Program Committee.

Mr. Pogeler asked about the possibility of a joint meeting of the cooperative cottonseed and soybean oil mill officials and suggested that further discussions with both groups be held in that regard.